Signal strength **40** thus can also be used to detect the presence or absence of a fluid, as well as the composition of detected fluids.

[0051] The signal strength **40** is a function of the relative dielectric constants and other electrical properties of each fluid. The results indicated that water yielded the highest signal strength **42**, followed by alcohol **46** and then oil **44**. The surface air showed no substantial signal level as expected with the sensor array and touchpad sensor circuitry being used. It will most likely be necessary to test the sensing and examination capabilities of the present invention in order to understand fully what the present invention is capable of detecting.

[0052] The output also indicates the level or depth **50** of each fluid, relative to the sensor array **34**. Thus, the invention indicates the boundary between each of the fluids as indicated by a zero-crossing **52** on the graph between the layers of each of the fluids. It is noted that depth in the x-axis is in arbitrary units, but in this case is approximately 0.5 mm. Likewise, the signal strength shown in the y-axis is also in arbitrary units. What was important is that the signal strengths of the various fluids can be compared in order to obtain the desired information.

[0053] It is noted that previous experiments have shown that electrically conductive fluids (e.g. salt water) produce a maximum signal level that is not dependent on the dielectric constant of the conducting fluid for those conductive elements on the sensor array that are disposed in the conducting fluid. However, the sensing method of the present invention can still be applied to determine the fluid levels because measurements between conductive elements that are not in the conducting fluid will appear as previously described.

[0054] It is envisioned that the invention can be applied to process management and control in a variety of industries, including oil pumping from wells, chemical processing and storage, and the storage of other materials which can be in solid, fluid or gaseous form. In other words, the present invention will also function with gases and solids, to varying degrees of success.

[0055] It is also envisioned that the present invention can be used to: 1) detect changes in electrical properties of surrounding media due to chemical reactions or changes in temperature, 2) detect the existence and magnitude of waves or other disturbances in each of the layers of fluid, 3) detect the addition or removal of any fluid by any means, 4) detect the degree of mixing and/or separation of different fluids, 5) detect differences in properties of the fluid in multiple locations within the container by use of multiple sensing elements or sensing elements whose geometry is designed for such purposes, and 6) detect the effects in two or three dimensions, depending upon the sensor's geometry and accompanying data processing capabilities.

[0056] Regarding separation of the sensor array from the fluid being detected and/or analyzed, separation of as much as 0.3 inches has been demonstrated. The present invention is probably capable of even greater separations. Successful detection may also depend upon the electrical properties such as the dielectric constant of the fluid being measured. Thus, the sensor array can be coated with a variety of non-conducting materials or be separated from the container by a variety of non-conducting materials. Furthermore, orientation and geometry of the sensor array with respect to the fluid being detected and/or analyzed can greatly influence functionality of the present invention.

[0057] Other aspects of the present invention that should be mentioned are the ability to respond rapidly to changes over time, the ability to make continuous measurements as opposed to discrete, one-time measurements, and the fact that direct contact between the sensor and the fluid, solid, or gas is not required.

[0058] It is to be understood that the above-described arrangements are only illustrative of the application of the principles of the present invention. Numerous modifications and alternative arrangements may be devised by those skilled in the art without departing from the spirit and scope of the present invention. The appended claims are intended to cover such modifications and arrangements.

What is claimed is:

1. A system for performing fluid level determination of at least one fluid, said system comprising:

a sensor array formed from a substrate and a plurality of conductive elements disposed thereon that create an array of sensor electrodes, wherein the sensor array includes at least one sensing surface;

touchpad sensor circuitry coupled to the sensor array for receiving signals from the sensor array that are indicative of electrical properties of the at least one fluid;

the at least one fluid disposed adjacent to the sensor array and which is in a proximity sensing range thereof; and

wherein the touchpad sensor circuitry provides data regarding a level of the at least one fluid relative to the at least one sensing surface of the sensor array.

2. The system as defined in claim **1** wherein the substrate is further comprised of a flexible substrate material that is capable of conforming to arcuate surfaces.

3. The system as defined in claim **2** wherein the at least one sensing surface conforms to a surface against which the flexible substrate material is disposed.

4. The system as defined in claim **1** wherein the system is further comprised of a container within which the at least one fluid is disposed.

5. The system as defined in claim **4** wherein the sensor array is disposed within the container.

6. The system as defined in claim **5** wherein the sensor array is coated in a protective material if the at least one fluid within the container can damage materials used in the sensor array.

7. The system as defined in claim **4** wherein the sensor array is disposed outside the container.

8. The system as defined in claim **7** wherein the sensor array is disposed flush against an outer wall of the container to thereby maximize exposure of the at least one sensing surface to the at least one fluid within the container.

9. The system as defined in claim **1** wherein the means for determining characteristics of the at least one fluid further comprises means for determining characteristics of the at least one fluid that can be derived from capacitance-sensing technology of the system.

10. The system as defined in claim **1** wherein the system further comprises means for determining a presence or absence of the at least one fluid within proximity sensing range of the system.

11. The system as defined in claim **1** wherein the system further comprises means for determining composition of the least one fluid within proximity sensing range of the system.

12. The system as defined in claim **1** wherein the system further comprises means for determining a fluid level of a